SECTION 555
REINFORCING STEEL

555.01 DESCRIPTION. This work is furnishing and placing reinforcing steel and wire fabric.

555.02 MATERIALS. Furnish materials meeting the following Subsection requirements:

Reinforcing Steel 711.01.1
Epoxy-Coated Reinforcing Bars 711.01.2
Wire and Wire mesh 711.01.3

555.03 CONSTRUCTION REQUIREMENTS.

555.03.1 Protection of Material. Protect reinforcing steel from damage. Store reinforcing and supports on blocks.

Handle epoxy-coated steel reinforcing with padded or nonmetallic slings and padded straps to prevent damage to the epoxy coating. Store the bars on wooden cribs. Damaged material will be rejected, or repaired meeting AASHTO M 284 at Contractor expense.

555.03.2 Fabrication. Bend reinforcing bar as specified in the Contract.

Bend all bars cold. Do not field bend bars partially imbedded in concrete unless otherwise specified.

Meet Table 555-1 bend radii for standard hooks and all other bars other than stirrups and ties. Provide a minimum inside radii of 2 bar diameters for stirrups and ties.

TABLE 555-1
MINIMUM BENDING RADII

BAR SIZE	MINIMUM INSIDE RADII
3 thru 8 (10M thru 25M)	3 bar diameters
9 thru 11 (30M and 35M)	4 bar diameters
14 or 18 (45M and 55M)	5 bar diameters

Obtain the Project Manager's approval for special fabrication or bends exceeding 90 degrees for No's. 14S and 18S reinforcing steel.

Ship reinforcing bar in bundles tagged and marked meeting the Concrete Reinforcement Steel Institute Code of Standard Practice.

Submit fabrication drawings when specified or requested.

555.03.3 Placing and Fastening. Place the reinforcing steel as shown in the Contract and hold in place during concrete work.

Assure steel reinforcing is free of loose rust and scale, dirt, paint, oil, or other foreign material.

Verify the anchor bolt clearances before placing reinforcing steel.

Tie bars at all intersections unless bar spacing is less than 1 foot (305 mm) in each direction, which requires alternate intersections be tied.

Provide the minimum cover for reinforcing bars shown in Table 555-2.

TABLE 555-2
MINIMUM BAR EMBEDMENT

Top of Slab	2 3/8-inches (60 mm)
Bottom of Slab	1-inch (25 mm)
Stirrups and Ties	1 ½-inches (38 mm)
Footing and Pier Shafts	3-inches (75 mm)

Separate forms using stays, ties, hangers, metal chairs, blocks, or other approved supports.

Precast mortar blocks may be used at locations approved by the Project Manager, excluding supports for bridge deck slab reinforcing steel. Use blocks precast from concrete used on the project and water cured for 7 days before use. Use blocks of the size specified having an embedded wire for fastening to the reinforcing bar. Separate bar layers using precast mortar blocks, upper continuous metal chairs, or other approved devices.

Separate the upper and lower mats of reinforcing steel for deck slabs, depending upon the vertical distance between the mats, using "Upper Continuous High Chair (U.C.H.C.)" or "Slab Bolsters with Runners (S.B.R.)". Place Continuous bar supports at right angles to structure centerline for "Flat Slab" structures and parallel to structure centerline for all other deck slabs. Do not use pebbles, pieces of broken stone, concrete rubble, broken brick or building blocks, metal pipe, or wooden blocks.

Use metal chairs and supports contacting epoxy-coated bars that are epoxy coated or coated with another inert approved coating.

Use plastic-coated tie wires to tie the coated bars in place.

Space deck slab reinforcing supports a maximum 4 feet (1200 mm). Space supports closer if necessary to prevent deflection during placement of concrete.

Obtain the Project Manager's approval of reinforcing placement before placing concrete. Remove concrete placed before inspection.

Flatten rolled reinforcing fabric into sheets before placing.

555.03.4 Splicing. Furnish all reinforcing steel in the specified lengths. Splice as shown in the contract or as directed.

555.03.5 Reinforcing Steel-Material Guaranty & Random Sampling. Furnish for each shipment of reinforcing steel delivered to the project, duplicate copies of the following:

1. Shipping invoice showing the weight and price per pound (kilogram) of all of the steel in the shipment;
2. Certified mill test reports showing physical and chemical analysis on each heat of reinforcing steel;

3. A statement from the fabricator certifying that the mill tests furnished are representative of the reinforcing steel furnished and that it meets Subsection 106.09 requirements;
4. For epoxy-coated reinforcing bars, the coating applicator must furnish with each shipment 2 copies of a certificate of compliance confirming that the coated reinforcing bars were cleaned, coated, and tested meeting the requirements of AASHTO M 284 and Subsection 106.09. Additionally, the certification must include for each bar size the preheat temperatures, cure times, thickness checks, holidays detected, and bend test results. Submit 1 copy of this certification to the laboratory.

A shipment is the quantity of reinforcing steel in each truckload delivered to the project. When delivery is by railroad car, each 20 tons (18.1 mt), or fraction thereof, is a shipment.

Furnish the samples as requested for testing.

Do not place concrete until the steel test results are known. If a reinforcing steel sample fails, two additional samples representing the failed sample will be tested. If either of the check samples fail, the steel in the shipment represented by the failing sample may be rejected; or if the Project Manager determines that the steel is usable, a price reduction will be assessed as follows:

$$P = A \times B$$

Where:

A = Total invoice price of reinforcing steel in the lot.*

B = 10%, 20%, or 30%, dependent upon departure from specifications. The value to be used will be determined by the Engineer.

P = Price reduction for the lot.

* A lot is defined as all the bars of one bar number and pattern of deformation contained in an individual shipment.

The amount of reduction calculated above will be deducted from monies due the Contractor on the final estimate.

Remove and replace all rejected steel at Contractor expense. Furnish invoice statements, mill reports, and fabrication certificates for replacement steel. Replacement steel is subject to the tests specified above.

No reinforcing steel in a shipment will be final accepted until the test results are known. The Contractor may proceed with the work at its own risk before testing.

555.04 METHOD OF MEASUREMENT. The reinforcing steel quantity in the Contract is the calculated theoretical weight of the steel in pounds (kilograms), measured as shown in the contract or ordered in writing, complete in place and accepted.

Plan quantities will not be re-measured except as provided for in Subsection 555.05.

The weights of standard sizes of reinforcing bars meeting the requirements of AASHTO M 31 are computed using Table 555-3.

TABLE 555-3
WEIGHTS OF STANDARD SIZES OF REINFORCING BARS

BAR SIZE	WEIGHT
No. 3 Bars	0.376 Lb Per Foot
No. 4 Bars	0.668 Lb Per Foot
No. 5 Bars	1.043 Lb Per Foot
No. 6 Bars	1.052 Lb Per Foot
No. 7 Bars	2.044 Lb Per Foot
No. 8 Bars	2.670 Lb Per Foot
No. 9 Bars	3.400 Lb Per Foot
No. 10 Bars	4.303 Lb Per Foot
No. 11 Bars	5.313 Lb Per Foot
No. 14 Bars	7.650 Lb Per Foot
No. 18 Bars	13.600 Lb Per Foot
(METRIC)	
BAR SIZE	**MASS**
# 10M Bars	0.785 kg/m
# 15M Bars	1.570 kg/m
# 20M Bars	2.355 kg/m
# 25M Bars	3.925 kg/m
# 30M Bars	5.495 kg/m
# 35M bars	7.850 kg/m
# 45M Bars	11.775 kg/m
# 55M Bars	19.625 kg/m

Non-standard reinforcing bars or wire fabric, when required, have the unit weight specified in the contract.

No allowance is made for clips, wires, separators, or other material used for fastening or supporting the reinforcing steel.

555.05 BASIS OF PAYMENT. Payment for the completed and accepted quantities is made under the following:

Pay Item	Pay Unit
Reinforcing Steel	Pound (kilogram)

Reinforcing steel is paid in place for the quantities shown in the Contract, except as follows:

1. The calculated quantities involved in changes ordered in writing by the Engineer are added or deducted from the plan quantities;
2. A recalculation will be made and the corrected quantity will be included for payment, in lieu of the plan quantity, when the plan quantity of reinforcing steel in any complete structure is in error by five percent or more. A complete structure is the smallest portion of a total structure for which a quantity is included in the Contract. The party to the Contract requesting an adjustment shall present to the other party three copies of the description, location and recalculated quantities of the structure having the quantity error.

The following percentages of the total quantity of reinforcing steel in place is paid on progress estimates:

1. 85% when placed and tied;
2. 90% when covered with concrete;
3. 100% when random tests are complete and the material is accepted.

Payment at the contract unit price is full compensation for all necessary resources to complete the item of work under the Contract.